

## CHAPTER 11. HELICOPTER PROCEDURES

### Section 1. Administrative

**1100. GENERAL.** This chapter contains criteria for application to "helicopter only" procedures. These criteria are based on the premise that helicopters are approach Category A aircraft with special maneuvering characteristics. The intent, therefore, is to provide relief from those portions of other TERPS chapters which are more restrictive than the criteria specified herein. However, any criteria contained elsewhere in other chapters of this document may be applied to helicopter only procedures when an operational advantage may be gained.

*a. Identification of Inapplicable Criteria.* Criteria contained elsewhere in this document normally apply to helicopter procedures. Where this chapter changes such criteria, the changed material is identified. Circling approach and high altitude penetration criteria do not apply to helicopter procedures.

*b. Use of Existing Facilities.* Helicopter only procedures based on existing facilities may be developed using criteria contained in this chapter.

**1101. TERMINOLOGY.** The following terms are peculiar to helicopter procedures and are defined as follows:

*a. HAL.* Height above landing area elevation.

*b. HAS* Height Above the Surface. The height of the MDA above the highest terrain/surface within a 5,200-foot radius of the MAP in Point in Space procedures.

*c. Landing Area* as used in helicopter operations refers to the portion of the heliport or airport runway used, or intended to be used for the landing and takeoff of helicopters.

*d. Landing Area Boundary (LAB).* The beginning of the landing area of the heliport or runway.

*e. Point in Space Approach* is an instrument approach procedure to a point in space, identified as a missed approach point, which is not associated with a specific landing area within 2,600 feet of the MAP.

*f. Touchdown zone* as used in helicopter procedures is identical to the landing area.

**1102. DELETED.**

**1103. TYPE OF PROCEDURE. HELICOPTER ONLY PROCEDURES** are designed to meet low altitude straight-in requirements ONLY.

\* **1104. FACILITIES FOR WHICH CRITERIA ARE NOT PROVIDED.** This chapter does not include criteria for procedures predicated on VHF/UHF DF, area navigation (RNAV), airborne radar approach (ARA), or microwave landing system (MLS). Procedures utilizing VHF/UHF DF may be developed in accordance with the appropriate chapters of this documents. Criteria for RNAV, ARA, and MLS with high glide path angle or selectable glide path angle capability will be developed at a later date.

**1105. PROCEDURE IDENTIFICATION.** Helicopter only procedures shall bear an identification which includes the term "COPTER," the type of facility providing final approach course guidance, and a numerical identification of the final approach course, e.g., COPTER VOR 090, COPTER NDB 270, COPTER PAR 327, COPTER ASR 327, etc. If the procedure includes an arc final approach, the word "ARC" will be used, and will be followed by a sequential number, e.g., COPTER VORTAC ARC 1, COPTER VOR/DME ARC 2, COPTER TACAN ARC 3, etc.

NOTE: Where separate procedures at the same location use the same type of facility and same final approach course such procedures will be differentiated by adding an alphabetical suffix.

### Section 2. General Criteria

**1106. APPLICATION.** These criteria are based on the unique maneuvering capability of the helicopter at airspeeds not exceeding 90 knots.

**1107. POINT IN SPACE APPROACH.** Where the center of the landing area is not within 2,600 feet of the MAP, an approach procedure to a point in space may be developed using any of the facilities for which criteria are provided in this chapter. In such procedures the point in space and the missed approach point are identical and upon arrival at this point, helicopters must proceed under visual flight rules (or special VFR in control zone as applicable) to a landing area or conduct the specified missed approach procedure. The published procedure shall be noted to this effect and also should identify available landing areas in the vicinity by noting the course and distance from the MAP to each selected landing area. Point in space approach procedures will not contain alternate minima.

**1108. APPROACH CATEGORIES.** When helicopters use instrument flight procedures designed for fixed wing aircraft, approach Category "A" approach minima shall apply regardless of helicopter weight.

**1109. PROCEDURE CONSTRUCTION.** Paragraph 214 applies except for the reference to circling approach.

**1110. DESCENT GRADIENT.** The descent gradient criteria specified in other chapters of this document do not apply. The optimum descent gradient in *all* segments of helicopter approach procedures is 400 feet per mile. Where a higher descent gradient is necessary, the recommended maximum is 600 feet per mile. However, where an operational requirement exists, a gradient of as much as 800 feet per mile may be authorized, provided the gradient used is depicted on approach charts. See special procedure turn criteria in paragraph 1112.

**1111. INITIAL APPROACH SEGMENTS BASED ON STRAIGHT COURSES AND ARCS WITH POSITIVE COURSE GUIDANCE.** Paragraph 232 is changed as follows:

*a. Alignment.*

(1) **Courses.** The 2-mile lead radial specified in paragraph 232a(1) is reduced to 1 mile. See Figure 3.

(2) **Arcs.** The minimum arc radius specified in paragraph 232a(2) is reduced to 4 miles. The 2-mile lead radial may be reduced to 1 mile. See Figure 10.

**1112. INITIAL APPROACH BASED ON PROCEDURE TURN.** Paragraph 234 applies except for all of subparagraph d and the number 300 in subparagraph e(1) which is changed to 600. Since helicopters operate at approach Category A speeds the 5-mile procedure turn will normally be used. However, the larger 10- and 15-mile areas may be used if considered necessary.

*a. Descent Gradient.* Because the actual length of the track will vary with environmental conditions and pilot technique, it is not practical to specify a descent gradient solely in feet per mile for the procedure turn. Instead, the descent gradient is controlled by requiring the procedure turn completion altitude to be as close as possible to the final approach fix altitude. The difference between the procedure turn completion altitude and the altitude over the final approach fix shall not be greater than those shown in Table 23.

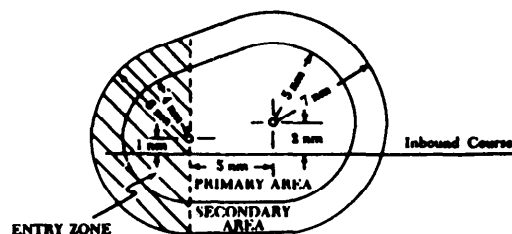


Figure 105. HELICOPTER PROCEDURE TURN AREA.  
Par 1112.

Table 23. PROCEDURE TURN COMPLETION ALTITUDE DIFFERENCE. Par 1112.

Type Procedure Turn	Altitude Difference
15 mile PT from FAF	Within 6000 ft of alt over FAF
10 mile PT from FAF	Within 4000 ft of alt over FAF
5 mile PT from FAF	Within 2000 ft of alt over FAF
15 mile PT, no FAF	Not Authorized
10 mile PT, no FAF	Within 4000 ft of MDA on Final
5 mile PT, no FAF	Within 2000 ft of MDA on Final

**1113. INTERMEDIATE APPROACH SEGMENT BASED ON STRAIGHT COURSES.** Paragraph 242 is changed as follows:

*a. Alignment.* The provisions of paragraph 242a apply with the exception that the intermediate course shall not differ from the final approach course by more than 60 degrees.

*b. Area.*

(1) **Length.** The OPTIMUM length of the intermediate approach segment is 2 miles. The minimum length is 1 mile and the recommended maximum is 5 miles. A distance greater than 5 miles should not be used unless an operational requirement justifies the greater distance. When the angle at which the initial approach course joins the intermediate course exceeds 30 degrees (see figure 3), the MINIMUM length of the intermediate course is as shown in table 24.

**1114. INTERMEDIATE APPROACH SEGMENT BASED ON AN ARC.** Paragraph 243 is changed as follows: Arcs with a radius of less than 4 miles or more than 30 miles from the navigation facility shall not be used.

*a. Area.*

(1) **Length.** The OPTIMUM length of the intermediate approach segment is 2 miles. The minimum length is 1 mile and the recommended maximum is 5 miles. A distance greater than 5 miles should not be used unless an operational requirement justifies the greater distance. When the angle at which the initial approach course joins the intermediate course

Table 24. MINIMUM INTERMEDIATE COURSE LENGTH  
(Not applicable to PAR and ILS)

ANGLE (degrees)	MINIMUM LENGTH (miles)
30	1.0
60	2.0
90	3.0
120	4.0

*Note: This table may be interpolated.*

exceeds 30 degrees (see figure 3), the MINIMUM length of the intermediate course is as shown in table 24.

**1115. INTERMEDIATE SEGMENT WITHIN A PROCEDURE TURN SEGMENT.** Paragraph 244b is changed as follows: The normal procedure turn distance is 5 miles from the fix or from the facility. This produces an intermediate segment 5 miles long. The portion of the intermediate segment considered for obstacle clearance will always have the same length as the procedure turn distance. A distance greater than 5 miles should not be used unless an operational requirement justifies the greater distance. See figure 13, paragraph 244.

**1116. FINAL APPROACH.** Paragraph 250 applies except that the word runway is understood to include landing area and the reference to circling approach does not apply. The final approach course in precision approach procedures shall be aligned as indicated in paragraphs 1152 and 1159. For nonprecision procedures final approach course alignment shall be as follows:

*a. Approaches to a Landing Area.* The final approach course should be aligned so as to pass through the landing area. Where an operational advantage can be achieved, a final approach course which does not pass through the landing area may be established, provided such a course lies within 2600 feet of the center of the landing area at the MAP.

*b. Point-in-Space Approaches.* The final approach course should be aligned to provide for the most effective operational use of the procedure consistent with safety.

**1117. MISSED APPROACH POINT.** Paragraph 272 is changed to state that the specified distance may not be more than the distance from the final approach fix to a point not more than 2600 feet from the center of the landing area. The MAP may be located more than 2600 feet from the landing area, provided the minimum visibility agrees with the increased distance; e.g., MAP 3800 feet from landing area, basic visibility is 3/4 mile. See figure 108. For point-in-space approaches the MAP is on the final approach course at the end of the final approach area.

**1118. STRAIGHT MISSED APPROACH AREA.** Paragraph 273 applies with the exception that the length of the primary and secondary missed approach area is

reduced from 15 miles to 7.5 miles and will have the width of the appropriate airway at termination.

**1119. STRAIGHT MISSED APPROACH OBSTACLE CLEARANCE.** Paragraph 274 applies except that "TDZ or airport elevation" is changed to "landing area elevation;" the slope of the missed approach surface is changed from 40:1 to 20:1; and the secondary area slope is changed from 12:1 to 4:1.

**1120. TURNING MISSED APPROACH AREA.** The provisions of paragraph 275 apply with the exception that when applying missed approach criteria shown in figures 19 through 24, and table 5, change all flight path lengths to 7.5 miles, missed approach surface slope to 20:1, secondary slopes to 4:1, obstacle clearance radius (R) to 1.3 miles, and flight path radius (R<sub>f</sub>) to 4000 feet (.66 miles). The area width will expand uniformly to the appropriate airway width.

**1121. TURNING MISSED APPROACH OBSTACLE CLEARANCE.** All missed approach areas described in paragraph 276 and depicted in figures 25 and 26 will be adjusted for helicopter operation using the values shown in paragraph 1120. The area width will expand uniformly to the appropriate airway width.

**1122. COMBINATION STRAIGHT AND TURNING MISSED APPROACH.** Paragraph 277 applies except that the values shown in paragraph 1120 shall be used, and point B is relocated to a position abeam the MAP. The area width will expand uniformly to the appropriate airway width. See figure 106.

**1123. HOLDING ALIGNMENT.** The provisions of paragraph 291 apply with the exception when the final approach fix is a facility, the inbound holding course shall not differ from the final approach course by more than 90 degrees.

**1124. HOLDING AREA.** Paragraph 292 applies except that the minimum size pattern is No.1.

### Section 3. Takeoff and Landing Minimums

**1125. APPLICATION.** The minimums specified in this section apply to Helicopter Only procedures.

**1126. ALTITUDES.** Chapter 3, section 2, is changed as follows:

a. In paragraph 320 "runway environment" is understood also to mean "landing area environment."

b. In paragraph 321 reference to 40:1 is changed to 20:1.

c. Paragraph 322 does not apply.

d. Paragraphs 324, 938 and 1028 apply except that a DH of 100 feet may be approved without approach lights; the tables in paragraph 350 do not apply, and table 29 in paragraph 1167 governs the establishment of the DH.

**1127. VISIBILITY.** Chapter 3, section 3, is changed as follows:

#### \* a. *Nonprecision Approaches.*

(1) **Approach to Runway.** The minimum visibility may be 1/2 the computed straight-in CAT A fixed-wing value from tables 6, 9, or 10, as applicable, but not less than 1/4 mile/1,200 RVR.

(2) **Approach to Landing Area.** (Landing area within 2600 feet of MAP). The minimum visibility required prior to applying credit for lights may not be less than the visibility associated with the HAL, as specified in table 25. Paragraphs 330 and 331 do not apply.

#### b. *Precision Approaches.*

(1) **Approach to Runway.** The minimum visibility may be 1/2 the computed straight-in CAT A fixed-wing values specified in tables 9 and 10, but not less than 1/4 mile/1200 RVR.

(2) **Approach to Landing Area.** The minimum visibility authorized prior to applying credit for lights is 1/2 mile/2400 RVR. Paragraphs 330 and 331 do not apply. \*

c. *Point-in-Space Approaches.* The minimum visibility prior to applying credit for lights is 3/4 mile. If the HAS exceeds 800 feet, the minimum no-lights visibility shall be 1 mile. No credit for lights will be authorized unless an approved visual lights guidance system is provided. See also paragraph 344. Alternate minimums are not authorized. Table 25 does not apply.

**EXAMPLE**

MDA is 360' MSL based on obstacles in the approach area. A 1098' MSL controlling obstacle is 1 mile (6076') from the near edge of Section 1.

A 20:1 surface which clears the obstacle has a height of 794' MSL at the near edge of Section 1.

6076 Divided by 20 Equals 304    1098 Minus 304 Equals 794.

To determine minimum altitude at which the missed approach aircraft may start the turn add 250' obstacle clearance and round up the sum to the next higher 20' increment.

794' Plus 250' Equals 1044'    rounded up Equals 1060' MSL.

To climb 700' from MDA 360' MSL to the turning altitude (1060' MSL) at the 20:1 climb gradient requires 14,000'. This is the minimum length of Section 1.

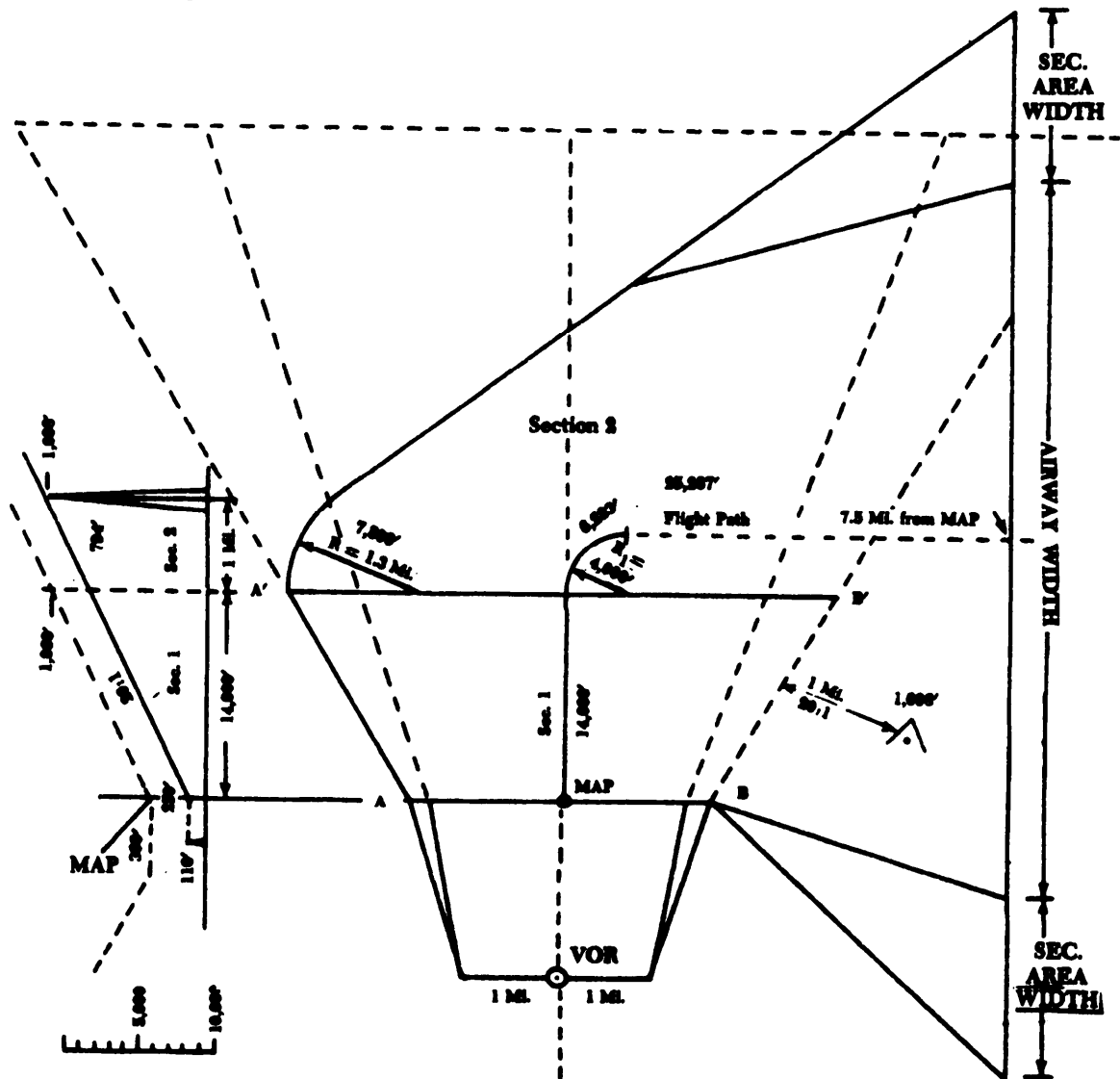


Figure 106. COMBINATION MISSED APPROACH AREA. Paragraph 1122.

- \* 1128. **VISIBILITY CREDIT.** Where visibility credit for lighting facilities is allowed for fixed-wing operations, the same type credit should be considered for helicopter operations. The approving authority will grant credit on an individual case basis, until such time

as a standard for helicopter approach lighting systems is established. The concepts stated in paragraph 342 apply, except heliport markings may be substituted for the runway marking requirements specified therein.

\*

Table 25. EFFECT OF HAL HEIGHT ON VISIBILITY MINIMUMS. Par 1127a

HAL	250-600 ft.	601-800 ft.	More than 800 ft.
Visibility Minimum (Mi)	1/2	3/4	1

\*

\*

**1129. TAKEOFF MINIMUMS.** Paragraph 370 does not apply. Helicopter takeoff minimums will be in accordance with the appropriate Federal Aviation Regulations and Military Regulations.

#### Section 4. On-Heliport VOR (No FAF)

**1130. GENERAL.** Paragraph 400 does not apply. These criteria apply to procedures based on a VOR facility located within 2600 feet of the center of the landing area in which no final approach fix is established. These procedures must incorporate a procedure turn.

**1131. INITIAL AND INTERMEDIATE SEGMENTS.** These criteria are contained in section 2 of this chapter.

**1132. FINAL APPROACH SEGMENT.** Paragraph 413 does not apply, except as noted below. The final approach begins where the procedure turn intersects the final approach course inbound.

*a. Alignment.* Paragraph 1116a applies.

*b. Area.* The primary area is longitudinally centered on the final approach course. The MINIMUM length is 5 miles. This may be extended if an operational requirement exists. The primary area is 2 miles wide at the facility and expands uniformly to 4 miles wide at 5 miles from the facility. A secondary area is on each side of the primary area. It is zero miles wide at the facility and expands uniformly to .67 mile on each side of the primary area at 5 miles from the facility. See figure 107.

*c. Obstacle Clearance.* Paragraph 413c(1) applies.

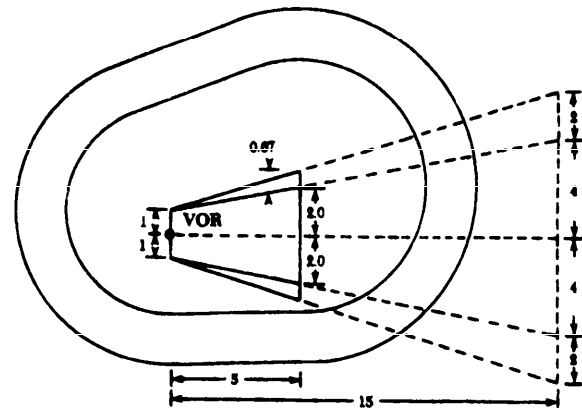


Figure 107. FINAL APPROACH PRIMARY AND SECONDARY AREA. On-Heliport VOR, No FAF, Par 1132b. See also Figure 105.

*d. Procedure Turn Altitude.* The procedure turn completion altitude shall be in accordance with table 23.

*e. Use of Stepdown Fix.* Paragraph 413e applies, except that 4 miles is changed to 2.5 miles.

*f. Minimum Descent Altitude.* Criteria for determining MDA are contained in section 3 of this chapter and chapter 3.

#### Section 5. TACAN, VOR/DME, and VOR with FAF

**1133. FINAL APPROACH SEGMENT.** Paragraph 513 does not apply, except as noted below.

*a. Alignment.* Paragraphs 1116a and b apply.

*b. Area.* Paragraph 513b applies, except that portion which refers to the minimum length of the final approach segment. The minimum length of the final approach segment is shown in table 26.

Table 26. MINIMUM LENGTH OF FINAL APPROACH SEGMENT (MILES)

Magnitude of Turn Over the Facility		
30°	60°	90°
1.0	2.0	3.0

NOTE: This table may be interpolated.

c. *Obstacle Clearance.* Paragraph 513.c.(1) applies.

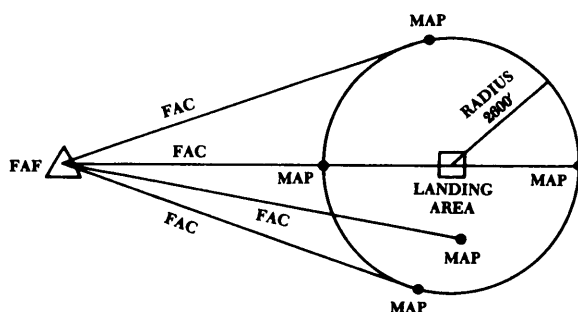
#### 1134. RESERVED

**1135. MISSED APPROACH POINT.** The identification of the MAP in Paragraph 514 is changed as follows: The missed approach point is a point on the final approach course which is not farther than 2600 feet from the center of the landing area. See Figure 108. For point in space approaches the MAP is on the final approach course at the end of the final approach area.

**1136. ARC FINAL APPROACH SEGMENT RADIUS.** Paragraph 523.b. does not apply. The final approach arc shall be a continuation of the intermediate arc. It shall be specified in nautical miles and tenths thereof. The minimum arc radius on final approach is 4 miles.

**1137. ARC FINAL APPROACH SEGMENT ALIGNMENT.** Paragraph 523.b.(1) does not apply. The final approach arc should be aligned so as to pass through the landing area. Where an operational advantage can be achieved, a final approach course which does not pass through the landing area may be established provided the arc lies within 2600 ft. of the landing area at the MAP.

#### 1138. RESERVED.



MISSED APPROACH POINT OPTIONS

Figure 108. MISSED APPROACH POINTS. Off-Heliport VOR with FAF. Par. 1135.

### Section 6. ON-HELIPORT NDB, No FAF

**1139. GENERAL.** Paragraph 600 does not apply. These criteria apply to procedures based on an NDB facility located within 2600 feet of the center of the

landing area in which no final approach fix is established. These procedures must incorporate a procedure turn.

**1140. FINAL APPROACH SEGMENT.** Paragraph 613 does not apply except as noted below. The final approach begins where the procedure turn intersects the final approach course, inbound.

a. *Alignment.* Paragraph 1116.a. applies.

b. *Area.* The primary area is longitudinally centered on the final approach course. The MINIMUM length is 5 miles. This may be extended if an operational requirement exists. The primary area is 2.5 miles wide at the facility, and expands uniformly to 4.25 miles wide at 5 miles from the facility. A secondary area is on each side of the primary area. It is zero miles wide at the facility, and expands uniformly to .67 miles wide on each side of the primary area at 5 miles from the facility. Figure 109 illustrates the primary and secondary areas.

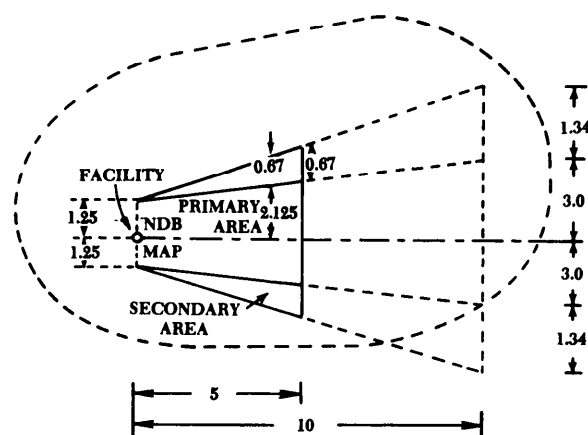


Figure 109. FINAL APPROACH PRIMARY AND SECONDARY AREAS. On-Heliport NDB. No FAF. Paragraph 1140.

c. *Obstacle Clearance.* Paragraph 613.c.(1) applies.

d. *Procedure Turn Altitude (Descent Gradient).* The procedure turn completion altitude shall be in accordance with Table 23.

e. *Use of Stepdown Fix.* Paragraph 613.e. applies except that 4 miles is changed to 2.5 miles.

f. *Minimum Descent Altitude.* Criteria for determining the MDA are contained in Section 3 of this chapter and Chapter 3.

### Section 7. NDB Procedures with FAF

**1141. GENERAL.** These criteria apply to procedures based on an NDB facility which incorporates a final approach fix.

**1142. FINAL APPROACH SEGMENT.** Paragraph 713 does not apply except as noted below:

*a. Alignment.* Paragraphs 1116.a. and b. apply.

*b. Area.* Paragraph 713.b. applies except that portion which refers to the minimum length of the final approach segment. The minimum length is specified in Table 26.

*c. Obstacle Clearance.* Paragraph 713.c.(1) applies.

**1143. MISSED APPROACH POINT.** The identification of the MAP in Paragraph 714 is changed as follows: The missed approach point is a point on the final approach course which is not farther than 2600 feet from the center of the landing area. See Figure 108. For point in space approaches, the MAP is on the final approach course at the end of the final approach area.

### Section 8. RESERVED.

**1144. – 1149. RESERVED.**

### Section 9. ILS Procedures

**1150. GENERAL.** Chapter 9 is changed as noted in this section. These criteria apply to the present design of instrument landing systems (on airport) only.

**1151. INTERMEDIATE APPROACH SEGMENT.** Paragraph 922 applies with the exception that Table 27 specifies the minimum length of the intermediate segment based on the angle of intersection of the initial approach course with the localizer course.

**1152. FINAL APPROACH SEGMENT.** Paragraph 930 applies except that glide slope intercept

need not occur prior to the FAF normally used for fixed wing operations.

*a.* The optimum length of the final approach course is 3.0 miles. The minimum length is 2.0 miles. A distance in excess of 4.0 miles should not be used unless a special operational requirement exists.

*b. Final Approach Termination.* The final approach shall terminate at a landing point (runway) or at a hover point between the Decision Height and the GPI. Where required, visual hover/taxi routes will be provided to the terminal area.

**1153. MISSED APPROACH AREA.** Normally existing missed approach criteria will be utilized for helicopter operations. However, if an operational advantage can be gained, the areas described in Paragraphs 1168 through 1171 may be substituted.

**1154. MICROWAVE ILS.** Additional criteria will be developed to exploit the capabilities of the microwave ILS which is now under development. It is expected that this new equipment will provide glide slope angles in the range from 3 to 12 degrees and the flexibility to satisfy special aircraft and ground siting requirements.

**1155. LOCALIZER AND LDA.** Section 5 of Chapter 9 is changed as noted in this paragraph.

*a. Alignment.* Paragraph 952 applies except that LDA alignment shall be as specified in paragraphs 1116.a. and b.

*b. Area.* Paragraph 953 applies except that portion which refers to the minimum length of the final approach segment. The minimum length of the final approach segment is shown in Table 26.

*c. Missed Approach Point.* The identification of the MAP in Paragraph 957 is changed as follows: The missed approach point is a point on the final approach course which is not farther than 2600 feet from the landing area. See Figure 108. For point-in-space approaches, the MAP is on the final approach course at the end of the final approach area.

## Section 10. Precision Approach Radar (PAR)

**1156. INTERMEDIATE APPROACH SEGMENT.** Paragraph 1014 applies with the exception that Table 27 specifies the minimum length of the intermediate segment based on the angle of intersection of the initial approach course with the intermediate course.

**Table 27. INTERMEDIATE SEGMENT ANGLE OF INTERCEPT VS. SEGMENT LENGTH. Paragraph 1156.**

Angle (Degrees)	Minimum Length (Miles)
30	1
60	2
90	3

*NOTE: This table may be interpolated.*

### 1157. RESERVED.

**1158. FINAL APPROACH SEGMENT.** The provisions of Paragraph 1020.b.(1) and (2) do not apply. The minimum distance from the glide slope intercept point to the GPI is 2 miles.

**1159. FINAL APPROACH ALIGNMENT.** Paragraph 1020.a. applies with the exception that a final approach course shall be aligned to a landing area. Where required, visual hover/taxi routes shall be established leading to terminal areas.

### 1160. FINAL APPROACH AREA.

**a. Length.** The final approach area is 25,000 feet long, measured outward along the final approach course from the GPI. Where operationally required for other procedural considerations or for existing obstacles, the length may be increased or decreased symmetrically, except when glide slope usability would be impaired or restricted. See Figure 110.

**b. Width.** The final approach area is centered on the final approach course. The area has a total width of 500 feet at the GPI and expands uniformly to a total width of 8000 ft. at a point 25,000 ft.

outward from the GPI. The widths are further uniformly expanded or reduced where a different length is required as in Paragraph 1160.a. above. See Figure 110. The width either side of the centerline at a given distance "D" from the point of beginning can be found by using the formula  $250 + .15D = 1/2 \text{ width}$ .

### 1161. RESERVED.

**1162. FINAL APPROACH OBSTACLE CLEARANCE SURFACE.** Paragraph 1021 does not apply. The final approach obstacle clearance surface is divided into two sections.

**a. Section 1.** This section originates at the GPI and extends for a distance of 775 feet in the direction of the FAF. It is a level plane, the elevation of which is equal to the elevation of the GPI.

**b. Section 2.** This section originates 775 feet outward from the GPI. It connects with Section 1 at the elevation of the GPI. The gradient of this section varies with the glide path angle used.

(1) To identify the glide slope angle and associated final approach surface gradient to clear obstacles in Section 2:

(a) Determine the distance "D" from the GPI to the controlling obstacle and the height of the controlling obstacle above the GPI.

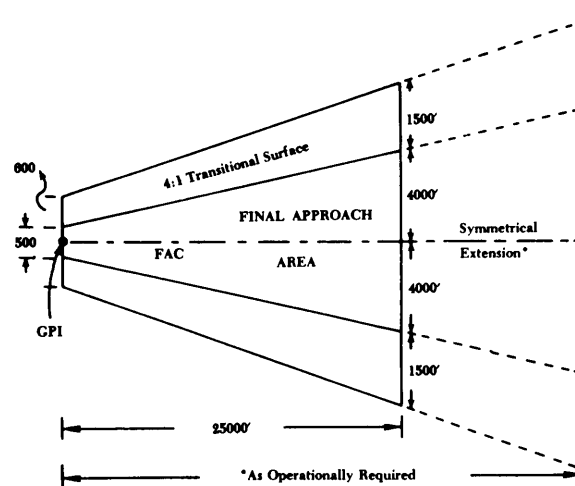


Figure 110. PAR FINAL APPROACH AREA.  
Par 1159 and 1160

**Table 28. FINAL APPROACH GLIDE SLOPE – SURFACE SLOPE ANGLES.**  
Par. 1162.b.

Glide Slope Angle (Degrees)	Less Than 3	3	4	5	6	7	8	12
Section 2 obstacle clearance surface gradient (degrees)	*	1.65	2.51	3.37	4.23	5.09	5.95	9.39

*NOTE: This table may be interpolated.*

*\* See Par 1165.a.*

(b) Enter these values in the formula:

$$\text{TAN. ANGLE} = \frac{\text{Obstacle height}}{\text{D-775}}$$

(c) Convert the tangent angle. This is the angle of the Section 2 approach surface gradient measured at the height of the GPI.

(d) The minimum glide slope angle required is found in Table 28.

**1163. TRANSITIONAL SURFACES.** Paragraph 1022 does not apply. Transitional surfaces for PAR are inclined planes with a slope of 4:1 which extend outward and upward from the edges of the final approach surfaces. They start at the height of the applicable final approach surface, and are perpendicular to the final approach course. They extend laterally 600 feet at the GPI and expand uniformly to a width of 1500 feet at 25,000 feet from the GPI.

**1164. OBSTACLE CLEARANCE.** Paragraph 1024 does not apply. No obstacle should penetrate the applicable final approach surfaces specified in Paragraph 1162 or the transitional surfaces specified in Paragraph 1163. Obstacle clearance requirements greater than 500 feet need not be applied unless required in the interest of safety due to precipitous terrain or radar system peculiarities.

*NOTE: The terrain in Section 1 may rise at a gradient of 75:1 without adverse effect on minimums provided the surface is free of obstacles.*

**1165. GLIDE SLOPE.** Required obstacle clearance is specified in Paragraph 1164. In addition, consideration shall be given to the following in the selection of the glide slope angle:

a. If angles less than 3 degrees are established, the obstacle clearance requirements shall be arrived at in accordance with Paragraphs 1024 and 1025.

b. Angles greater than 6 degrees shall not be established without authorization of the approving authority. The angle selected should be no greater than that required to provide obstacle clearance.

c. Angles selected should be increased to the next higher tenth of a degree, e.g., 4.71 degrees becomes 4.8; 4.69 degrees becomes 4.7.

**1166. RELOCATION OF THE GLIDE SLOPE.** Paragraph 1027 does not apply. The GPI shall normally be located at the arrival edge of the landing area. If obstacle clearance requirements cannot be satisfied, or if other operational advantages will result, the GPI may be moved into the landing area provided sufficient landing area is available forward of the displaced or relocated GPI.

**1167. ADJUSTMENT OF DH.** An adjustment is required whenever the angle to be used exceeds 3.8 degrees. See Table 29. This adjustment is necessary to provide ample deceleration distance between the DH point and the landing area.

**1168. MISSED APPROACH OBSTACLE CLEARANCE.** No obstacle may penetrate a 20:1 missed approach surface which overlies the missed

**Table 29. MINIMUM DH – GS ANGLE RELATIONSHIP.**  
Par. 1167.

GS Angle (degrees)	up to 3.80	3.81 to 5.70	Over 5.70
Minimum DH (feet)	100	150	200

approach areas illustrated in Figures 113, 114 and 115. The missed approach surface originates at the GPI. However, to gain relief from *existing* obstacles in the missed approach area the point at which the surface originates may be relocated as far backward from the GPI as a point on the final approach course which is directly below the MAP. In such cases the surface originates at a height below the DH as specified in Table 30. See Figure 112.

**NOTE:** When penetration of the 20:1 surface originating at the GPI occurs, an upward adjustment to the DH equal to the maximum penetration of the surface should be considered.

**1169. STRAIGHT MISSED APPROACH AREA.** The straight missed approach (maximum of 15 degree turn from final approach course) area starts at the MAP and extends to 7.5 miles.

*a. Primary Area.* This area is divided into three sections.

(1) **Section 1A** is a continuation of the final approach area. It starts at the MAP and ends at the GPI. It has the same width as the final approach area at the MAP.

(2) **Section 1B** is centered on the missed approach course. It begins at the GPI and extends to a point 1 mile from the MAP outward along the missed

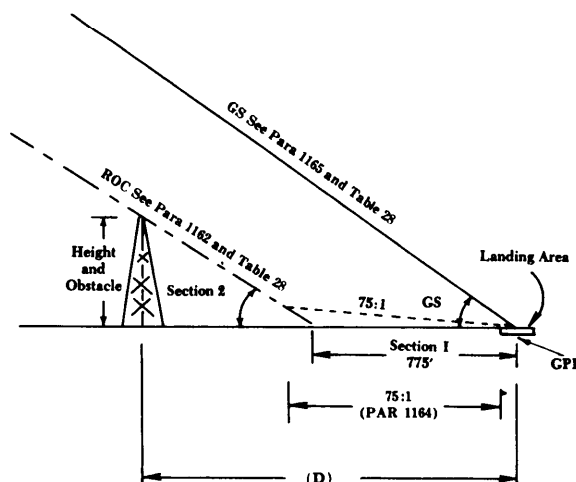


Figure 111. FINAL APPROACH AREA SURFACE AND OBSTACLE CLEARANCE. Paragraphs 1162 and 1164.

**Table 30. BEGINNING POINT OF MISSED APPROACH SURFACE. Par. 1168.**

GS Angle (Degrees)	3	6	9
Dist. below DH point (feet)	100	150	200

**NOTE:** This table may be interpolated.

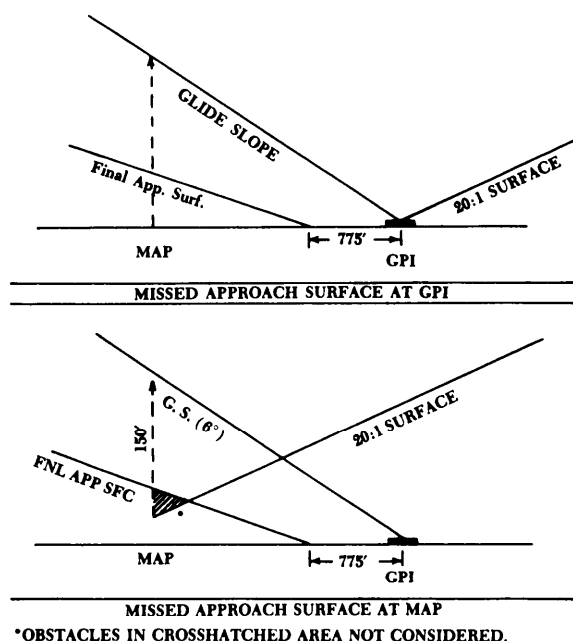


Figure 112. MISSED APPROACH SURFACE OPTIONS (Par 1168)

approach course. It has a beginning width the same as the final approach area at the MAP and expands uniformly to 4000 feet at 1 mile from the MAP.

(3) **Section 2** is centered on the continuation of the Section 1B course. It begins 1 mile from the MAP and ends 7.5 miles from the MAP. It has a beginning width of 4000 feet, expanding uniformly to a width equal to that of an initial approach area at 7.5 miles from the MAP.

*b. Secondary Area.* The secondary area begins at the MAP, where it has the same width as the final approach secondary area. In Section 1A the width remains constant from the MAP to the GPI, after which it increases uniformly to the appropriate airway width at 7.5 miles from the MAP. See Figure 113.



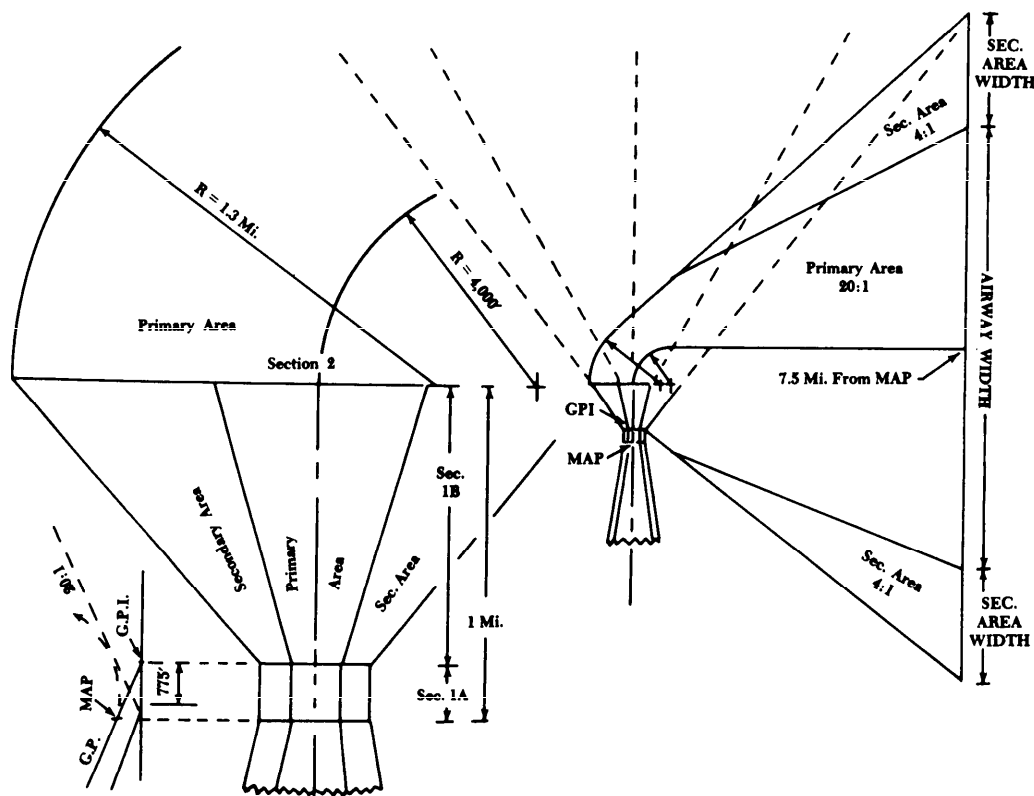


Figure 114. TURNING MISSED APPROACH AREA.  
Par 1170.

as specified in Paragraph 1169 except that Section 2A has no secondary areas. Obstacle clearance is provided as specified in Paragraph 1119. The length of Section 2A is determined as shown in Figure 115, and relates to the need to climb to a specified altitude prior to commencing the turn. The line A'-B' marks the end of Section 2A. Point C' is 5300 feet from the end of Section 2A.

**b. Turning Portion.** Section 2B is constructed as specified in Paragraph 1169 except that it begins at the end of Section 2A instead of the end of Section 1. To determine the height which must be attained before commencing the missed approach turn, first identify the controlling obstacle on the side of Section 2A to which the turn is to be made. Then measure the distance from this obstacle to the nearest edge of the Section 2A area. Using this distance as illustrated in Figure 115, determine the height of

the 20:1 slope at the edge of Section 2A. This height plus 250 feet (rounded off to the next higher 20 foot increment) is the height at which the turn should be started. Obstacle clearance requirements in Section 2B are the same as those specified in Paragraph 1121 except that Section 2B is expanded to start at Point C if no fix exists at the end of Section 2A or if no course guidance is provided in Section 2 (see Figure 115).

**NOTE:** The missed approach areas expand uniformly to the appropriate airway width.

#### Section 11. Airport Surveillance Radar (ASR)

**1172. INITIAL APPROACH SEGMENT.** Paragraph 1041.a.(1) applies except that 90 degrees is changed to 120 degrees.

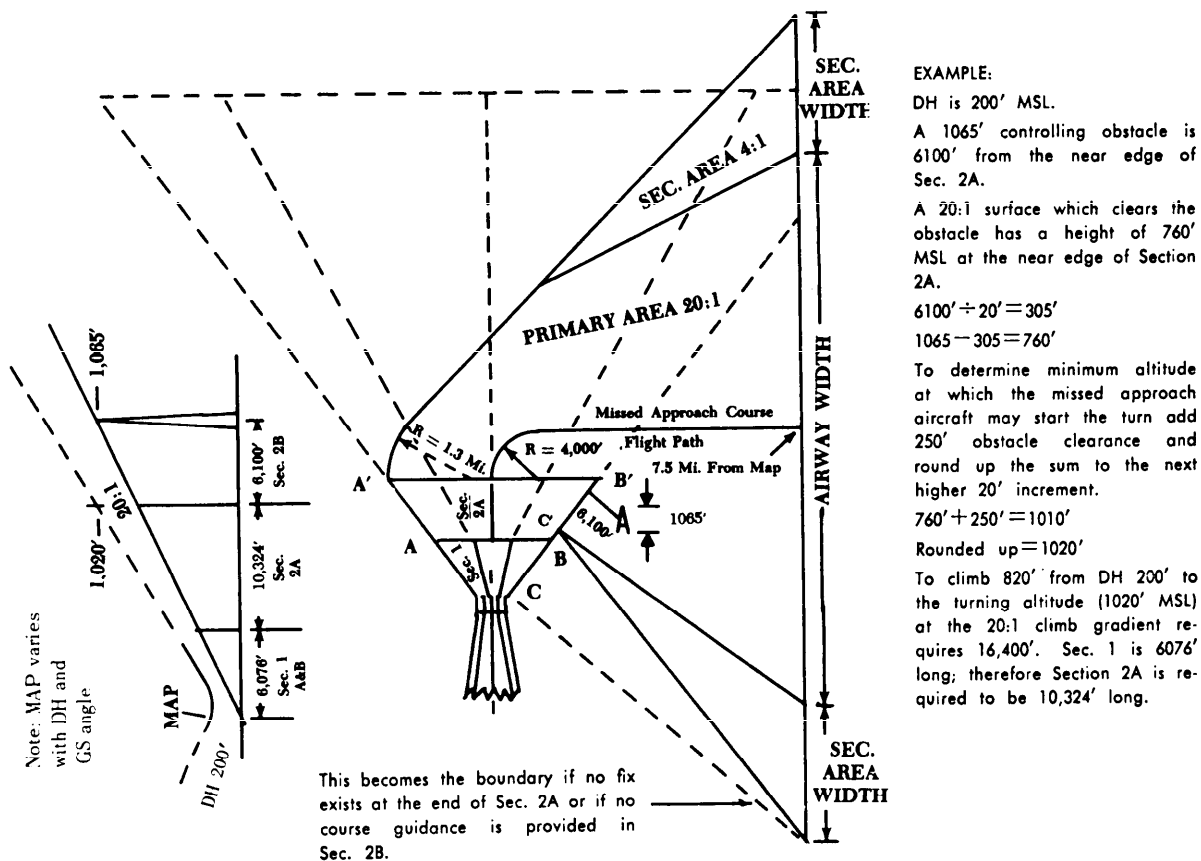


Figure 115. COMBINATION STRAIGHT AND TURNING MISSED APPROACH. Paragraph 1171.

**1173. INTERMEDIATE APPROACH SEGMENT.** Paragraph 1042.b. applies with the exception that the maximum angle of intercept is changed to 120 degrees and Table 24 is used to determine the required minimum length of the intermediate segment.

**1174. FINAL APPROACH SEGMENT.** Paragraph 1044 applies except for subparagraphs a., c.(2) and d.

*a. Alignment.* Paragraphs 1116.a. and b. apply.

**1175. MISSED APPROACH POINT.** The identification of the MAP in Paragraph 1048 is changed as follows. The missed approach point is a point on the final approach course which is not farther than 2600 feet from the center of the landing area. See Figure 108. For point in space approaches the MAP is on the final approach course at the end of the final approach area.

**1176.-1199. RESERVED.**